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is not suited for the determination of sulphur in kerosene, since even a poor oil must not contain more than a few tenths of one per cent. of sulphur and only a small amount of the oil can be used. Probably by tenths was intended a few hundredths of one per cent. Of course the simplest way for sulphur in kerosene is the lamp method that has been used by the Standard Oil Company for many years. But sulphur to thousandths of one per cent. in any crude petroleum or in any of its products, except perhaps the most volatile gasoline, may be expeditiously determined by combustion in oxygen and titration. This standard method in use for years is not mentioned.

Neither Texas, Ohio, nor other American crudes, except those in California, contain any large proportion of nitrogen compounds, and these compounds so far as examined are not of the pyridine series but, including Baku-crude, they are derivatives of the hydroquinolines.

However, those minor inaccuracies do not detract from the usefulness that this book offers to all workers in these broad fields.

CHARLES F. MABERY

#### THE ADOPTION OF THE MISSOURI SYSTEM OF GRADING AT GOUCHER COLLEGE

At Goucher College the faculty has recently adopted the "Missouri System" of grading. It may be of interest to some who are contemplating the introduction of this system, or to others interested in the theory and practise of grading, to learn a few of the details of this proposed application of the system.

Four passing grades and two grades below passing are defined. Grade C is to be assigned to approximately the middle 50 per cent. of each class. Grades A and B together are assigned to those above C, grade A being that of approximately the uppermost 3 per cent. and B that of about the other 22 per cent. In the opposite direction, grade D is to be assigned, in required courses, to approximately the 15 per cent., and in other courses to about the 22 per cent., just below C. Grade E is to indicate incomplete work or unsatisfactory work that can easily be made up, such as is customarily

marked "conditioned." Grade F denotes failure to receive any credit for the course. Grades E and F together are to be assigned, according to the discretion of the instructor, to approximately the lowest 10 per cent. in required courses, and to the lowest 3 per cent. in other courses.

These percentages are summarized as follows:

|                           | Passing Grades |    |    |    | Not Passing |
|---------------------------|----------------|----|----|----|-------------|
|                           | A              | B  | C  | D  | E and F     |
| In required courses ..... | 3              | 22 | 50 | 15 | 10          |
| In other courses .....    | 3              | 22 | 50 | 22 | 3           |

It will be seen that grade A is intended to mark work of unusually good quality which it seemed desirable, in the absence of any other system of "honors" in the college, to distinguish from that accomplished among so large a group as the upper fourth. The difference in the percentages of conditioned and failed (E and F) in required and not-required courses, is intended partly as a check upon entrance; it also takes into account the fact that under the usual conditions of admission to colleges, there should be a considerable elimination of the poorest students during the first years of the college course, when the proportion of required courses is high. Moreover, this arrangement recognizes that students are guided somewhat in their choice of elections by the advice of instructors and by their tendency to elect work in subjects which experience has shown them fitted to continue.

Theoretically the elimination of the poorest students in the required work early in the curriculum would affect slightly the sizes of all the remaining groups in the advanced or elective courses, but in practise this effect would probably not extend beyond the lowest passing grade; hence grade D is enlarged in these courses, while the middle and higher grades are not altered. Whether this will result in justice on the whole, can be determined only after experience with the system.

The size of the upper grades A and B is not increased in the most advanced or major courses, for the simple reason that to do so would in effect be applying the standard of

the elementary course to the work of the advanced course. When expectation or requirement concerning quality of work advances in correspondence with the advanced character of the courses, justice is most nearly assured by assigning approximately the same percentages of grades A, B, C in all courses.

The system as adopted emphasizes also the idea that the proposed percentages may not be precisely observed in any single class in a single year, especially among the smaller classes. But it is expected that the deficiencies in the assignments of particular grades of one year, will be balanced by the excesses of another year, so that there will be no constant tendency on the part of any instructor's grades to deviate widely from the percentages agreed upon. In very small classes the grades of a single year may deviate more widely from the ideal than those of the larger classes, but the combined reports of several years are expected to show essential approximation to the definitions.

WM. E. KELLICOTT

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### SPECIAL ARTICLES

#### A SAFE PORTABLE LAMP BATTERY

THE use for class work in physiological laboratories of zinc and ammonium chloride, or other forms of cells, is inconvenient and involves constant renewal. To supply large classes with dry batteries becomes an item of considerable expense. When the 110-volt direct current is available "lamp batteries" (or, properly speaking, lamp resistances) are more convenient, and cheaper to use; and if they are permanently installed under the work bench where the student can not alter the connections nor easily short circuit them, they are safe enough.

For many purposes, however, it is more convenient to have the lamps mounted on a piece of board six or eight inches square, so that the battery can be carried anywhere about the laboratory and connected with any socket by means of a cord and plug. The great disadvantage of such a portable battery is that with inexperienced students it may easily re-

sult in a serious blow-out. Thus with the ordinary arrangement of the lamps, as shown in Fig. 1, if *B* is the live wire and *A* is the grounded wire of the city lines (and one is usually grounded), no harm results if *E* happens to come in contact with a gas or water pipe. But if *A* is the live wire, and one happens (as there is an even chance of doing) to have pushed the plug into the socket so that the lamp *C* is nearest to the grounded line, then the whole pressure of the city system bears upon any chance contact of *F* with any metal object leading to ground.

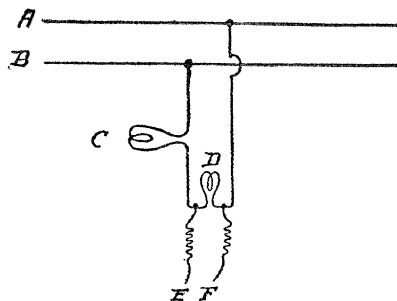


FIG. 1

To avoid this danger the form of battery shown in Fig. 2 has proved convenient. To give the same current the lamps *C* and *C'* in Fig. 2 must be twice the size (twice the current consumption and illuminating power, or in other words half the resistance) of *C* in

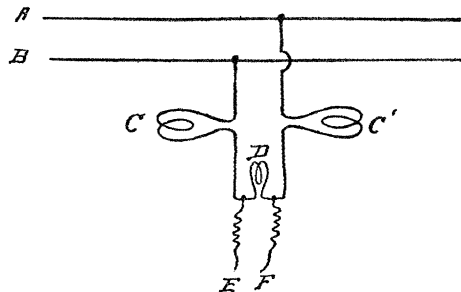


FIG. 2

Fig. 1. As both sides of the battery are then the same, it does not matter whether *A* or *B* is the live wire, nor which way the plug is put into the socket. If *E* or *F* happens to touch a grounded object, the lamp on that side merely